

WHAT WE CLAIMED IS:

1. A dot-recording device for recording ink dots on a surface of a print medium with the aid of a dot-recording head provided with a plurality of dot-forming elements for ejecting ink droplets, the dot-recording device comprising:

a main scanning unit configured to drive the dot-recording head and/or the print medium to perform main scanning;

a head driver configured to drive at least some of the dot-forming elements to form dots during the main scanning;

a platen configured to extend in the main scanning direction and to be disposed opposite the dot-forming elements at least along part of a main scan path, and the platen being configured to support the print medium at a position opposite the dot-recording head;

a sub-scanning unit configured to move the print medium to perform sub-scanning sub-scanning in between the main scans; and

a controller configured to control the dot recording device, wherein the platen has a slot extending in the main scanning direction, a width of the slot in the sub-scanning direction corresponding to a specific sub-scanning range on a surface of the dot recording head including at least part of the plurality of dot-forming elements.

2. A dot-recording device as defined in Claim 1, wherein the specific sub-scanning range includes at least one of two end ranges in the sub-scanning at opposite ends of the dot-recording head, each end range including at least one dot-forming element, and wherein the controller has:

(a) a first recording mode to effect printing near an edge of the printing medium, in the first recording mode the controller performing edge printing by ejecting ink droplets from at least some of the dot-forming elements disposed opposite the slot when the print medium is

supported on the platen, and the edge of the print medium is disposed above the slot, and

(b) a second recording mode to effect printing in an intermediate portion of the print medium, a maximum sub-scan feed amount in the second recording mode being greater than a maximum sun-scan feed amount in the first recording mode.

3. A dot-recording device as defined in Claim 2, wherein the controller prevents ink droplets from being ejected by dot-forming elements other than the dot-forming elements disposed opposite the slot during the edge printing.

4. A dot-recording device as defined in Claim 2, wherein the slot is disposed at a position opposite a dot-forming element that is located at a downstream edge in the sub-scanning direction; and

the controller performs the edge printing when a front edge of the print medium is disposed above the slot.

5. A dot-recording device as defined in Claim 2, wherein the slot is disposed at a position opposite a dot-forming element that is located at an upstream edge in the sub-scanning direction; and

the controller performs the edge printing when a rear edge of the print medium is disposed above the slot.

6. A dot-recording device as defined in Claim 2, wherein the sub-scanning unit comprises:

an upstream sub-scanning unit configured to hold and move the print medium, the upstream sub-scanning unit being disposed on an upstream side in the sub-scanning direction with respect to the dot-recording head; and

a downstream sub-scanning unit configured to hold and move the print medium, the downstream sub-scanning unit being disposed on a downstream side in the sub-scanning direction with respect to the dot-recording head.

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7. A dot-recording device as defined in Claim 2, wherein the sub-scanning of the first recording mode is performed in a feed amount corresponding to a single dot pitch in the sub-scanning direction.

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8. A dot-recording device as defined in Claim 2, wherein the controller performs the edge printing on the basis of image data representing an image extending outside the print medium beyond the edge on which the edge printing is performed.

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9. A dot-recording device as defined in Claim 8, wherein a length of an area of the image outside the print medium is set less than the slot width.

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10. A dot-recording device as defined in Claim 1, wherein the platen has

an upstream slot that extends in the main scanning direction at a position opposite a dot-forming element disposed at an upstream edge of the dot-recording head in the sub-scanning direction; and

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a downstream slot that extends in the main scanning direction at a position opposite a dot-forming element disposed at a downstream edge of the dot recording head in the sub-scanning direction; and

the controller comprises:

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a print data storage unit which stores print data partially composed of image data for recording images in an expanded area

that extends lengthwise beyond at least the front and rear edges of the print medium; and

an edge printing unit that ejects ink droplets onto the expanded area on the basis of the print data.

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11. A dot-recording device as defined in Claim 10, wherein the controller comprises:

an upper-edge positioning unit which selects the position of the print medium in the sub-scanning direction such that when ink droplets are ejected onto the front edge of the print medium,

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the print medium is supported on the platen,

the front edge of the print medium is brought to a point above the downstream slot, and

the front edge reaches a point located in the sub-scanning direction upstream of the dot-forming element on the downstream edge in the sub-scanning direction; and

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a lower-edge positioning unit which selects the position of the print medium in the sub-scanning direction such that when ink droplets are ejected onto the rear edge of the print medium,

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the print medium is supported on the platen,

the rear edge of the print medium is brought to a point above the upstream slot, and

the rear edge of the print medium reaches a point located in the sub-scanning direction downstream of the dot-forming elements on the upstream edge in the sub-scanning direction.

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12. A dot-recording device as defined in Claim 10, wherein the platen further has a pair of lateral slots separated apart at a distance substantially equal to a width of the print medium, the lateral slots extending in a sub-scanning range in which ink droplets are ejected from the plurality of dot-forming elements; and

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the dot-recording device further comprises

a guide for positioning the print medium in the main scanning direction such that the print medium is supported on the platen, and that the two edges of the print medium are kept at positions above the corresponding lateral slots.

13. A dot-recording device as defined in Claim 10, wherein the print data includes information about a recording condition of dots in pixels in the expanded areas.

14. A dot-recording device defined in Claim 1, wherein the platen comprises:

a first support configured to support the print medium, the first support extending in the main scanning direction at a position opposite a first sub-group of dot-forming elements selected from the plurality of dot-forming elements;

a first slot extending in the main scanning direction at a position opposite a second sub-group of dot-forming elements which are disposed in the sub-scanning direction downstream from the first sub-group of dot-forming elements;

a second support configured to support the print medium, the second support extending in the main scanning direction at a position opposite a third sub-group of dot-forming elements which are disposed in the sub-scanning direction downstream from the second sub-group of dot-forming elements.

15. A dot-recording device defined in Claim 1, wherein the platen comprises:

a first support configured to support the print medium, the first support extending in the main scanning direction at a position

opposite a first sub-group of dot-forming elements selected from the plurality of dot-forming elements;

5 a first slot extending in the main scanning direction at a position opposite a second sub-group of dot-forming elements which are disposed in the sub-scanning direction downstream from the first sub-group of dot-forming elements;

10 a second support configured to support the print medium, the second support extending in the main scanning direction at a position opposite a third sub-group of dot-forming elements which are disposed in the sub-scanning direction downstream from the second sub-group of dot-forming elements; and

15 a second slot extending in the main scanning direction at a position opposite a fourth sub-group of dot-forming elements which are disposed in the sub-scanning direction downstream from the third sub-group of dot-forming elements.

16. A dot-recording device as defined in Claim 15, wherein the controller has:

20 a first image printing mode in which dots are formed on the print medium with the aid of the second to fourth sub-groups of dot-forming elements without the use of the first sub-group of dot-forming elements, thereby printing images without blank spaces up to front and/or rear edges of the print medium; and

25 a second image printing mode in which dots are formed on the print medium with the aid of the first to fourth sub-groups of dot-forming elements, thereby printing images with blank spaces along the front and rear edges of the print medium.

30 17. A dot-recording device as defined in Claim 16, wherein a surface area of the print medium is divided into an upper-edge portion containing the front edge of the print medium, a lower-edge portion

containing the rear edge of the print medium, and an intermediate portion disposed between the upper-edge portion and lower-edge portion,

the controller further has:

5 an upper-edge printing mode in which dots are formed in the upper-edge portion of the print medium with the aid of the fourth subgroup of dot-forming elements without the use of any of the first to third sub-groups of dot-forming elements;

an intermediate printing mode in which dots are formed in the
10 intermediate portion of the print medium with the aid of the second to fourth sub-groups of dot-forming elements without the use of the first sub-group of dot-forming elements; and

a lower-edge printing mode in which dots are formed in the lower-edge portion of the print medium with the aid of the second
15 sub-group of dot-forming elements without the use of the first, third, or fourth sub-group of dot-forming elements.

18. A dot-recording device as defined in Claim 16, wherein the dot-recording head is aligned includes a plurality of dot-forming element groups for ejecting different types of ink, the plurality of dot-forming element groups being aligned in the main scanning direction,
20 and wherein

the first slot is a single slot provided opposite the second sub-groups of dot-forming elements selected; and

25 the second slot is a single slot provided opposite the fourth sub-groups of dot-forming elements.

19. A dot-recording method using a dot-recording device for recording ink dots on a surface of a print medium, dot recording device including a dot-recording head having a plurality of dot-forming elements for ejecting ink droplets, the method comprising the steps of:
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(A) providing a platen configured to extend in the main scanning direction and to be disposed opposite the dot-forming elements at least along part of a main scan path, the platen being configured to support the print medium at a position opposite the dot-recording head, and that has a slot extending in a main scanning direction, a width of the slot in a sub-scanning direction corresponding to a specific sub-scanning range on a surface of the dot recording head including at least part of the plurality of dot-forming elements, and

(B) printing images along the edges whereby ink droplets are ejected from at least some of the dot-forming elements disposed at positions opposite the slot when a front or rear edge of the print medium is disposed above the slot opening, and dots are formed on the print medium.

20. A dot-recording method as defined in Claim 19, wherein the specific sub-scanning range includes at least one of two end ranges in the sub-scanning at opposite ends of the dot-recording head, each end range including at least one dot-forming element, and wherein the step (B) comprises the steps of:

(B1) effecting printing near an edge of the printing medium in a first recording mode, in the first recording mode the controller performing edge printing by ejecting ink droplets from at least some of the dot-forming elements disposed opposite the slot when the print medium is supported on the platen, and the edge of the print medium is disposed above the slot, wherein the dot-recording method further comprises

(C) effecting printing in an intermediate portion of the print medium in a second recording mode, a maximum sub-scan feed amount in the second recording mode being greater than a maximum sun-scan feed amount in the first recording mode.

21. A dot-recording method as defined in Claim 20, wherein the step (B1) comprises a step of preventing ink droplets from being ejected by dot-forming elements other than the dot-forming elements disposed opposite the slot during the edge printing.

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22. A dot-recording method as defined in Claim 20, wherein the slot is disposed at a position opposite a dot-forming element that is located at a downstream edge in the sub-scanning direction; and the step (B1) comprises a step of performing the edge printing when a front edge of the print medium is disposed above the slot.

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23. A dot-recording method as defined in Claim 20, wherein the slot is disposed at a position opposite a dot-forming element that is located at an upstream edge in the sub-scanning direction; and the step (B1) comprises a step of performing the edge printing when a rear edge of the print medium is disposed above the slot.

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24. A dot-recording method as defined in Claim 20, wherein the step (B1) comprises a step of executing the sub-scanning of the first recording mode by performing in a feed amount corresponding to a single dot pitch in the sub-scanning direction.

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25. A dot-recording method as defined in Claim 20, wherein the step (B1) comprises a step of forming dots on the basis of image data representing an image extending outside the print medium beyond the edge on which the edge printing is performed.

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26. A dot-recording method as defined in Claim 19, wherein the platen comprises:

an upstream slot at a position opposite a dot-forming element disposed at an upstream edge of the dot-recording head in the sub-scanning direction, and

a downstream slot at a position opposite a dot-forming element disposed at a downstream edge of the dot recording head in the sub-scanning direction; and

the dot-recording method further comprises the step of:

(C) preparing print data containing the image data for recording images in an expanded area that extends lengthwise beyond at least the front and rear edges of the print medium, and

wherein step (B) comprises the step of:

(B1) ejecting ink droplets onto the expanded area on the basis of the print data.

27. A dot-recording method as defined in Claim 26, wherein step (B1) comprises the steps of:

(B2) when ink droplets are ejected onto the front edge of the print medium, positioning the print medium in the sub-scanning direction such that the print medium is supported on the platen, and that the front edge of the print medium is brought to a point above the downstream slot, and that the front edge reaches a point located in the sub-scanning direction upstream of the dot-forming element on the downstream edge in the sub-scanning direction; and

(B3) when ink droplets are ejected onto the rear edge of the print medium,

positioning the print medium in the sub-scanning direction such that the print medium is supported on the platen, and that the rear edge of the print medium is brought to a point above the upstream slot, and that the rear edge of the print medium reaches a point located in the sub-scanning direction downstream of the dot-forming elements on the upstream edge in the sub-scanning direction.

28. A dot-recording method as defined in Claim 26, wherein the platen further has a pair of lateral slots separated apart at a distance substantially equal to a width of the print medium, the lateral slots extending in a sub-scanning range in which ink droplets are ejected from the plurality of dot-forming elements; and

the image represented by the image data extends widthwise into opposite expanded areas beyond left and right edges of the print medium but remains between outside edges of the pair of lateral slots.

29. A dot-recording method as defined in Claim 28, wherein step (B1) comprises the step of:

(B4) when ink droplets are ejected onto the expanded areas on the bases of print data, restricting a position of the print medium in the main scanning direction such that the print medium is supported on the platen, and that the two edges of the print medium are kept at positions above the corresponding lateral slots.

30. A dot-recording method as defined in Claim 26, wherein the print data includes information about a recording condition of dots in pixels in the expanded areas.

31. A dot-recording method as defined in Claim 19, wherein the platen comprises:

a first support configured to support the print medium, the first support extending in the main scanning direction at a position opposite a first sub-group of dot-forming elements selected from the plurality of dot-forming elements;

a first slot extending in the main scanning direction at a position opposite a second sub-group of dot-forming elements which

are disposed in the sub-scanning direction downstream from the first sub-group of dot-forming elements;

a second support configured to support the print medium, the second support extending in the main scanning direction at a position opposite a third sub-group of dot-forming elements which are disposed in the sub-scanning direction downstream from the second sub-group of dot-forming elements; and

a second slot extending in the main scanning direction at a position opposite a fourth sub-group of dot-forming elements which are disposed in the sub-scanning direction downstream from the third sub-group of dot-forming elements, wherein the dot-recording method further comprises:

(C) a step of preparing a first image-printing mode for printing images without blank spaces up to front and/or rear edges of the print medium, and a second image-printing mode for printing images with blank spaces along the front and rear edges of the print medium, and

(D) a step of forming dots on the print medium with the aid of the first to fourth sub-groups of dot-forming elements in accordance with the second image-printing mode, wherein the step (B) comprises

(B1) a step of forming dots on a print medium with the aid of the second to fourth sub-groups of dot-forming elements without the use of the first sub-group of dot-forming elements in accordance with the first image-printing mode.

32. A dot-recording method as defined in Claim 31, wherein the step(B1) comprises:

(B2) a step of forming dots in the upper-edge portion of the print medium with the aid of the fourth sub-group of dot-forming elements without the use of any of the first to third sub-groups of dot-forming elements;

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(B3) a step of forming dots in the intermediate portion of the print medium with the aid of the second to fourth sub-groups of dot-forming elements without the use of the first sub-group of dot-forming elements; and

5 (B4) a step of forming dots in the lower-edge portion of the print medium with the aid of the second sub-group of dot-forming elements without the use of the first, third, or fourth sub-group of dot-forming elements.

10 33. A print control device for generating print data to be sent to a dot-recording unit that records ink dots on a surface of a print medium, the dot recording unit including a dot-recording head having a plurality of dot-forming elements for ejecting ink droplets, the dot-recording unit comprising a main scanning unit configured to drive
15 the dot-recording head and/or the print medium to perform main scanning; a head driver configured to drive at least some of the dot-forming elements to form dots during the main scanning; a platen configured to extend in the main scanning direction and to be disposed opposite the dot-forming elements at least along part of a
20 main scan path, and the platen being configured to support the print medium at a position opposite the dot-recording head; a sub-scanning unit configured to move the print medium to perform sub-scanning sub-scanning in between the main scans; and a controller configured to control the print control device, the platen comprises a slot
25 extending in the main scanning direction , a width of the slot in the sub-scanning direction corresponding to a specific sub-scanning range on a surface of the dot recording head including at least part of the plurality of dot-forming elements, the print control device comprising:

an image data generator for generating image data for an area outside the print medium beyond the edge on which the edge printing is performed.

5 34. A computer program product for recording ink dots on a surface of a print medium using a computer, the computer equipped with a dot-recording device for recording ink dots on the surface of a print medium with the aid of a dot-recording head provided with a plurality of dot-forming elements for ejecting ink droplets, wherein the
10 dot-recording device comprises a platen configured to extend in the main scanning direction and to be disposed opposite the dot-forming elements at least along part of a main scan path, the platen being configured to support the print medium at a position opposite the dot-recording head, and being configured to have a slot extending in the
15 main scanning direction, a width of the slot in the sub-scanning direction corresponding to a specific sub-scanning range on a surface of the dot recording head including at least part of the plurality of dot-forming elements; the computer program product comprising:

a computer readable medium; and

20 a computer program stored on the computer readable medium, the computer program comprising:

an image data generating program for causing the computer to generate image data for an area outside the print medium beyond the edge on which the edge printing is performed.

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35. A computer program product as defined in Claim 34,
wherein the dot-recording device comprises a platen configured to extend in the main scanning direction while disposed opposite the dot-forming elements at least along part of the main scan path, and
30 the platen being configured to have an upstream slot at a position opposite a dot-forming element disposed at an upstream edge of the

dot-recording head in the sub-scanning direction, and have a downstream slot at a position opposite a dot-forming element disposed at a downstream edge of the dot recording head in the sub-scanning direction; and wherein the image data generating program comprises

5 a first program for causing the computer to prepare print data containing the image data for recording images in an expanded area that extends lengthwise beyond at least front and rear edges of the print medium; and

10 a second program for causing the computer to eject ink droplets onto the expanded area on the basis of the print data.

36. A computer program product as defined in Claim 35, the image data generating program further comprises:

15 a third program for causing the computer to set the position of the print medium in the sub-scanning direction such that when ink droplets are ejected onto the front edge of the print medium,

the print medium is supported on the platen,

the front edge of the print medium is brought to a point above the downstream slot, and

20 the front edge reaches a point located in the sub-scanning direction upstream of the dot-forming element on the downstream edge in the sub-scanning direction; and

25 a fourth program for causing the computer to set the position of the print medium in the sub-scanning direction such that when ink droplets are ejected onto the rear edge of the print medium,

the print medium is supported on the platen,

the rear edge of the print medium is brought to a point above the upstream slot, and

30 the rear edge of the print medium reaches a point located in the sub-scanning direction downstream of the dot-forming elements on the upstream edge in the sub-scanning direction.

37. A computer program product as defined in Claim 35,
wherein the platen further has a pair of lateral slots separated apart
at a distance substantially equal to a width of the print medium , the
5 lateral slots extending in a sub-scanning range in which ink droplets
are ejected from the plurality of dot-forming elements; wherein the
first program comprises

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10 a program for causing the computer to prepare the image data
configured to represent the image that extends widthwise into
opposite expanded areas beyond left and right edges of the print
medium but that remains between outside edges of the pair of lateral
slots.

38. A computer program product as defined in Claim 37,
15 wherein the second program comprises

20 a program for causing the computer to set a position of the print
medium in the main scanning direction when ink droplets are ejected
onto the expanded areas on the bases of print data, such that the
print medium is supported on the platen, and that the two edges of
the print medium are kept at positions above the corresponding
lateral slots.

39. A computer program product as defined in Claim 35;
wherein the first program comprises

25 a program for causing the computer to prepare the print data
including information about a recording condition of dots in pixels in
the expanded areas.

40. A computer program product as defined in Claim 34,
30 wherein the platen comprises:

a first support configured to support the print medium, the first support extending in the main scanning direction at a position opposite a first sub-group of dot-forming elements selected from the plurality of dot-forming elements;

5 a first slot extending in the main scanning direction at a position opposite a second sub-group of dot-forming elements which are disposed in the sub-scanning direction downstream from the first sub-group of dot-forming elements;

10 a second support configured to support the print medium, the second support extending in the main scanning direction at a position opposite a third sub-group of dot-forming elements which are disposed in the sub-scanning direction downstream from the second sub-group of dot-forming elements; and

15 a second slot extending in the main scanning direction at a position opposite a fourth sub-group of dot-forming elements which are disposed in the sub-scanning direction downstream from the third sub-group of dot-forming elements, wherein the dot forming program comprises:

20 a first program for causing the computer to form dots on a print medium with the aid of the second to fourth sub-groups of dot-forming elements without the use of the first sub-group of dot-forming elements in accordance with a first image-printing mode for printing images without blank spaces up to front and/or rear edges of the print medium; and

25 a second program for causing the computer to form dots on the print medium with the aid of the first to fourth sub-groups of dot-forming elements in accordance with a second image-printing mode for printing images with blank spaces along the front and rear edges of the print medium.